

The book cover features a detailed illustration of numerous wasps, likely paper wasps, with their characteristic yellow and black striped abdomens and transparent wings. They are depicted in various poses, some flying and others resting, against a background of large, overlapping, brownish-grey rounded shapes that resemble a wasp nest or a textured surface. A large, bright yellow oval is centered on the right side of the cover, framing the title and author's name.

# Wasps

F.M. HAWORTH







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# WASPS



If you look at the picture on the opposite page, you will see the entrance to a wasps' nest. We had been watching this during the summer months. Can you find the small hole in the soil under the bramble bush? Each day thousands of wasps passed through this hole into a tunnel that leads to their home. You cannot see the nest itself, for that is underground; but we knew that if we waited until the frosts came, we could dig it up and look at it, for in the autumn most of the inhabitants get drowsy, fall asleep, and die. The only ones to survive are a few young queens who sleep through the winter and start building new nests the following spring. The old nests gradually rot away and fall to pieces during the winter months.

Let us think for a few moments of a village where a number of people living together as a group, or community, do all the work of the village themselves, and share out this work between them. Some will be builders, others farmers who provide food for the villagers; the mothers will keep the homes going and have children; and the teachers will teach the bigger children in school. There will, of course, be shopkeepers and other people with different kinds of work, but you can think this out for yourself. In this way each person will have his or her own work to do, and, in doing it, will help to make the life of the community go on smoothly.

Now life in a wasps' nest is in many ways like life in a village community, for wasps live together in large numbers and share out the work that has to be done. There is, however, only one mother in the nest, and she is called the QUEEN. She lays thousands of eggs;



in fact, all the insects in a nest develop from the eggs laid by this one queen. The wasps we saw going in and out of the hole in the ground are smaller than the queen and are called WORKERS. We watched them for several days to find out what they were doing. Some came to the tea-table and sipped the jam, others were seen chewing bits of meat, and hundreds of them were seen in the orchard feeding on apples, pears, and plums. Several apples were just like bags of skin, for the workers had cleaned out all the juicy part from the inside. Gardeners will tell you that in autumn wasps do a great deal of damage in the orchards, and for this reason they destroy all the nests they can find.

Other wasps were found in the garden visiting flowers, sipping nectar, the sticky syrup to be found there. All these things—syrup, fruit juices, meat (caterpillars and greenfly)—form the wasps' natural food. They are collected by the workers and carried back to the nest to feed the queen and the young.

One day in September we saw the third kind of wasp to be found in the community—the DRONE, or father wasp. These are present only in late summer.

If you look carefully at the pictures below, they will help you to recognise the queen, the workers, and the drones. They are all drawn life-size.



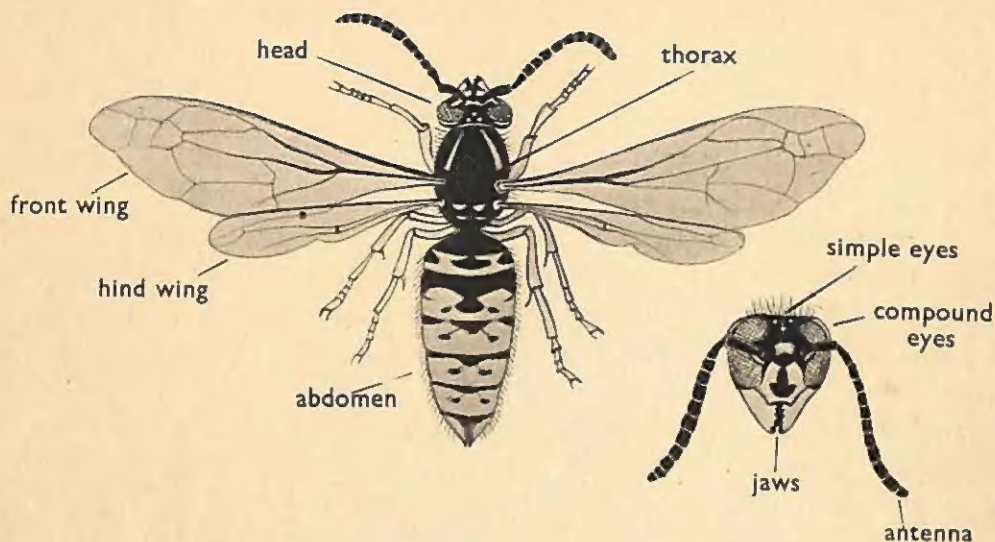
Queen



Worker



Drone



Queen Wasp x3

Head x4



This picture will help you to describe them.

Notice how the body is divided into three parts—a HEAD, then a chest part called the THORAX, and joined to the thorax by a thin waist, the ABDOMEN. Look again at the head and you will see two very large eyes at the side, and three tiny ones on the forehead. You may wonder why so many eyes are needed. It is thought that the large ones are for seeing things at a distance, and the small ones for seeing things near at hand. Each of the large eyes is really made up of thousands of tiny ones. If you look at them through a magnifying-glass, they look like a piece of net. Each space in the net is really one eye. There are also on the head two feelers, or antennae, and two jaws.



On the thorax are three pairs of jointed legs and two pairs of wings. These are transparent and are neatly folded lengthwise when not in use, so that they look only half their real width.

The queen is the largest wasp in the nest. How big is she? Can you describe her?

Now look at the drone. He can be recognised by his long, slender body, long antennae, and bright eyes. Drones have no sting, and do no work in the nest. They do not hatch out until August or September.

The workers are the smallest. During the summer many thousands are hatched in the nest, but all die before the winter. They do different kinds of work, and sting readily if annoyed. Some look after the queen and feed the young, while others go out and collect food. Still others scrape off wood from fences or trees, then chew it up with their strong jaws until it is made into a soft ball of pulp. This wood-pulp dries like paper and is used for building the nest. It is called "wasp paper". Some of the workers, therefore, are builders.

In any nest in October there are about ten thousand workers, a year-old queen, and probably about a hundred young queens and drones that have just hatched. These young queens soon leave the nest with the drones, who die when the cold weather comes. The young queens find some sheltered place in which to sleep for the winter. Soon after they have left, disaster comes to the community. The workers get restless and no longer feed the young; they stay out at night, and with the first frosts they fall asleep and die. The nest gradually rots away.

One day early in November a young queen flew into our room through the open window, wandered about restlessly, and then settled in the fold of the curtain. She fastened herself firmly with her jaws, folded her wings under her body, and went to sleep. Young queens do not always come into houses in winter; some find crevices in rotten wood or in trees; others find a corner in a

toolshed. Watch carefully and see if you can discover some of their sleeping-places. The picture shows you how they fix themselves with their jaws and fold their wings under the body.



It is a strange sleep, this winter sleep. We call it **HIBERNATION**. Many animals hibernate. They do not eat or drink, and they might almost be dead. November, December, January pass by; then February, March, and April. At last the warm sun in May gradually wakes them up. If many queens did not die during hibernation, when icy winds sweep over the countryside, there would be a plague of wasps in the land.

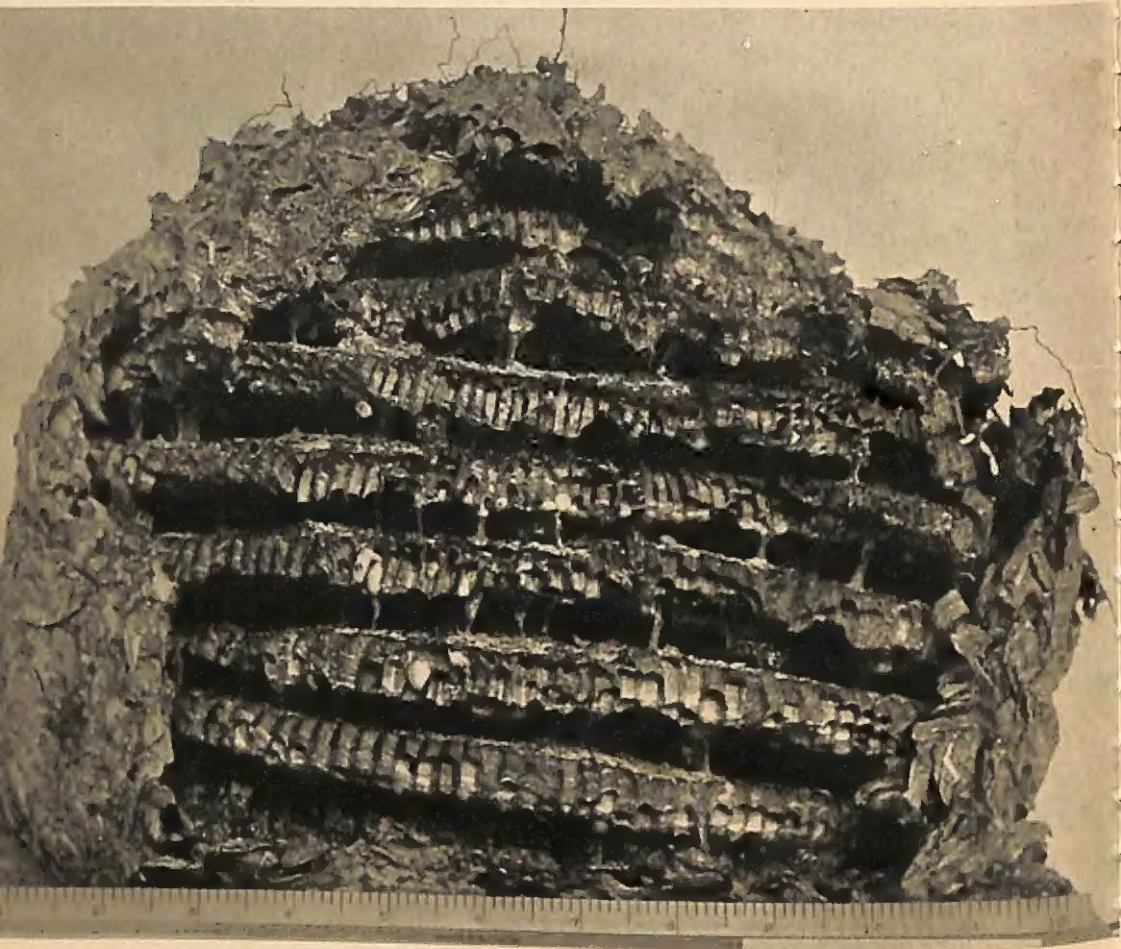
### *The Nest*

In November we decided to dig up the old nest. We took a spade, found the entrance, removed the grass from the surface, and dug down, following the tunnel. About three and a half feet below the surface we came to some greyish paper. We now dug very carefully, and suddenly, there it was—a big ball of grey paper the size of a football. The entrance into the nest was at the bottom. Look at the picture on page 11.

We broke away part of the outside wall, which was made of about five layers of wasp paper, and there inside was a wonderful sight. There were seven flat plate-like structures, or **SECTIONS** as they

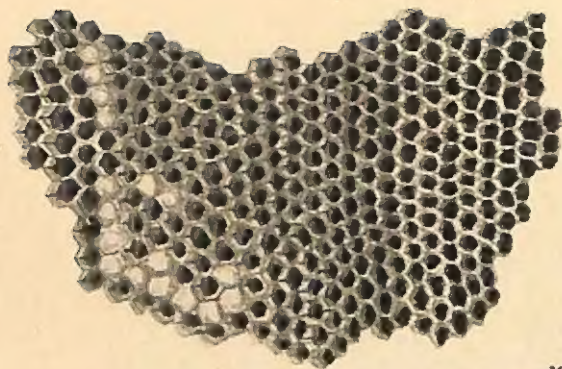


are called, arranged one above the other. These sections were held apart by tough pillars, leaving just enough room for a wasp to walk comfortably between. When new wood is used for making the paper, it looks yellow, but when old wood is used it looks grey.



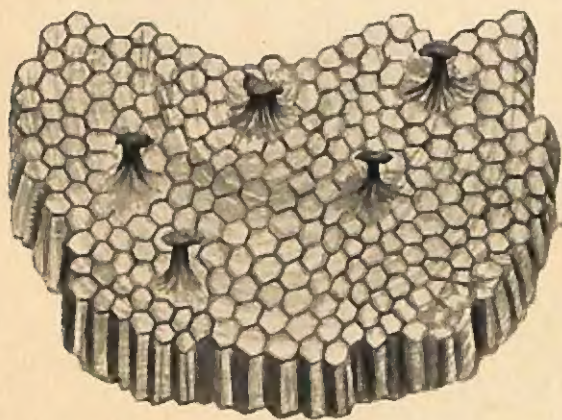
The photograph shows the nest removed from the soil, with part of the paper covering broken away to show the sections inside.





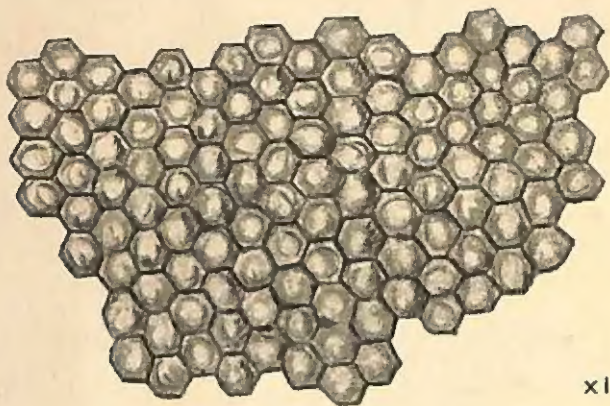
x1

This picture shows a section seen from below. There are hundreds of box-like CELLS, each cell being six-sided. These are the nurseries of the nest. Some of the cells have a silk cover over the opening.



This picture shows a section seen from above. It is flat and has no openings; but you can see the broken pillars that separated it from the section above.

Now look at the lowest section of the nest. Here the queens and drones are hatched. How is this section different from the others?



x1

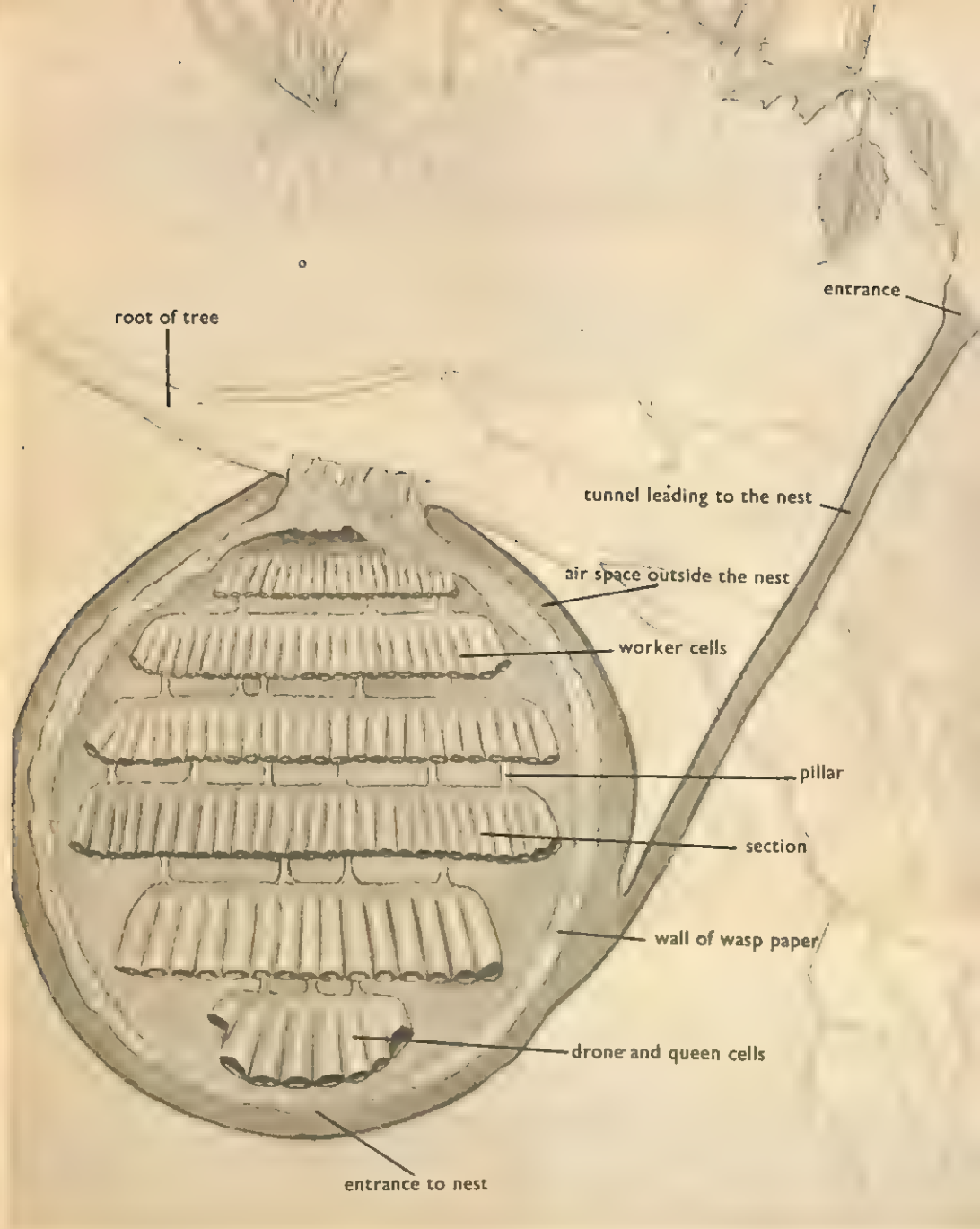
The picture at the bottom of the page shows part of the lowest section seen from the side, with silk caps covering most of the cells. Young queens are developing inside these cells.



x1

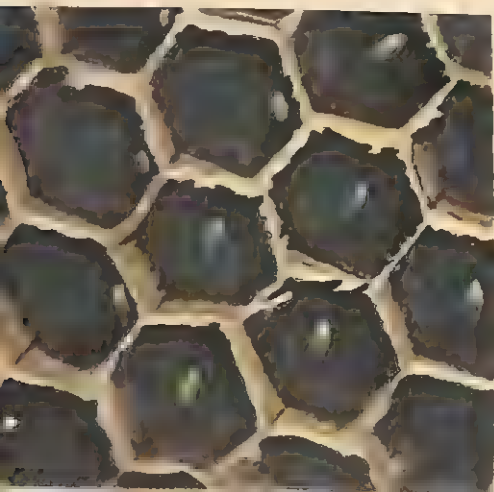
The diagram on the next page shows the nest underground.







This picture shows the queen and cells magnified five times. The queen is laying eggs. She places one white sausage-shaped egg on the side of each cell near the bottom.



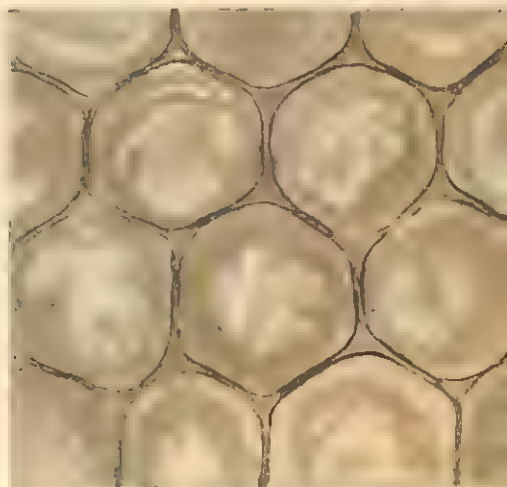
In this picture you can see the eggs. At the end of eight days each egg hatches into a legless grub, or LARVA.

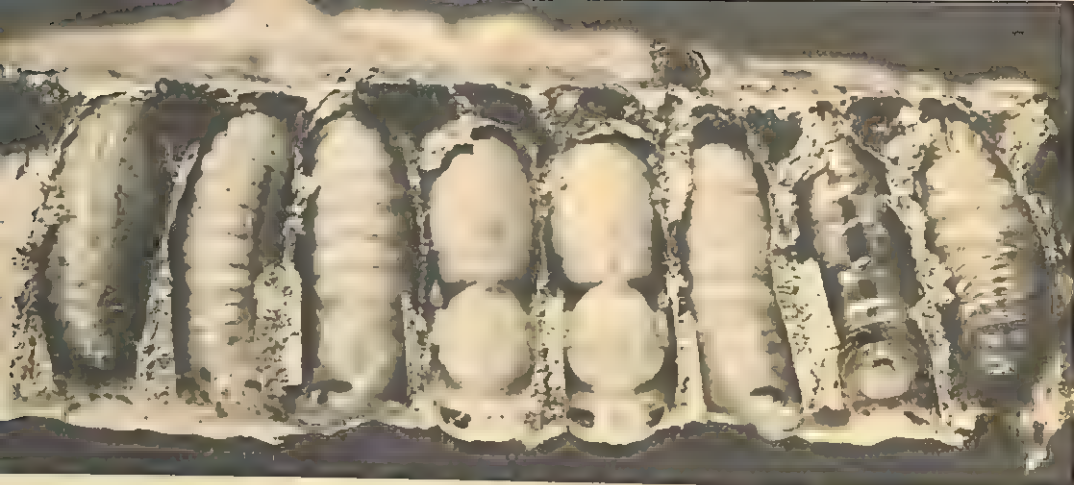


In a fortnight the larvae are full-grown. They then spin a silk case round themselves, and the lower part of this forms the silk cap of the cell. The larva stops feeding, splits its skin, and becomes a PUPA. If you looked inside the silk case, you would see that the pupa looked like a ghost wasp.



During the next ten days the body grows stronger, and the colour darkens until it looks like the adult wasp. She then bites her way through the silk cap, as you see in the bottom picture. After cleaning herself, she goes to the oldest larvae and taps one on the head until it gives her a drop of liquid from its mouth; then, nourished with this, she starts work in the nest.

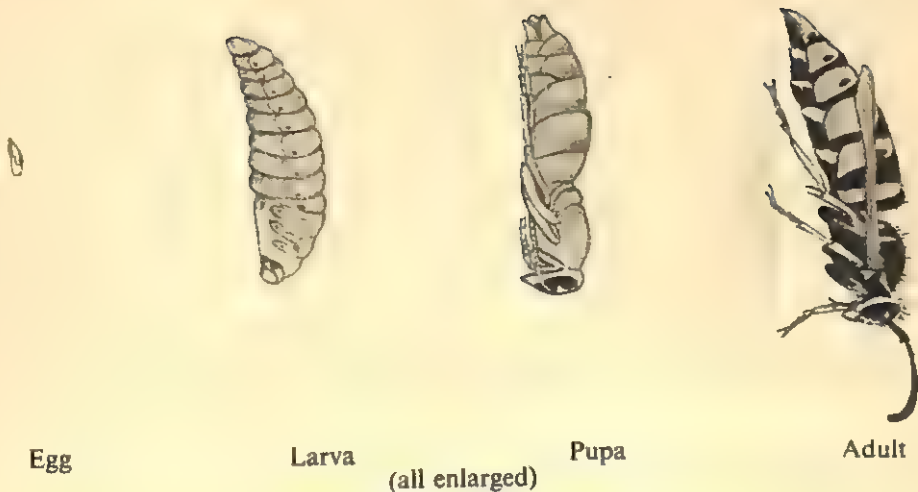




The top picture shows some of the larvae and pupae in their cells. In the bottom one, worker "nurses" are feeding the larvae on nectar and animal juices. Both pictures are a little more than twice natural size.







Egg, larva, pupa, and adult—these are the four stages in the life of every wasp. The cells in the lowest section of the nest are bigger than those of the others, and eggs laid in these cells grow into queens and drones. Besides having larger cells to grow up in, the larvae are fed on richer food.

### *The Building of the Nest*

In May, when the queen wakes from her long sleep, she spends some time cleaning herself before she begins a search for a place to build her nest. She brushes her head and body with her hairy legs and pulls her antennae through a bend in the front pair. Then she has a meal and flies off, searching along the bottom of hedges and tree-trunks until she finds a small hole that is suitable.

Now the great work of building begins. First she carries out bits of soil from the hole until she has made a small chamber in which to start the nest. If you watched her now, you would see her fly off to collect wood-pulp, and returning with this she would fix the small ball of it to a root in the cavity and then go off for more. Bit by bit she adds more of the pulp, which quickly dries to form paper.



One side removed

x1

Gradually a small stalk is formed from which hangs a tiny umbrella. Below this she makes a little plate of cells.

Into each of these cells she lays one egg. She still does not rest. More and more journeys are made to collect pulp; more and more eggs are laid. As soon as the first eggs hatch, the queen has to go out and collect food for the hungry larvae. Even when the oldest larvae have turned into pupae there are more baby larvae hatching from eggs laid in the newest cells. It is only after four or five weeks from the time she first began to build that the first workers bite their way out of the cells, and in a few days take over the work of enlarging the nest and feeding the young. From now on the queen never leaves the nest, and the rest of her life is spent in laying eggs.

As more and more wasps hatch, more sections are built, until the whole nest is about as big as a football. The workers organise themselves into building, nursing, cleaning, and foraging groups. You remember wasps are like the villagers we spoke of earlier, but in their community there is only one mother, and there are no teachers. It is a strange thing that the queen, who has never watched a nest being built, is able to start one in the true wasp pattern when her time comes.



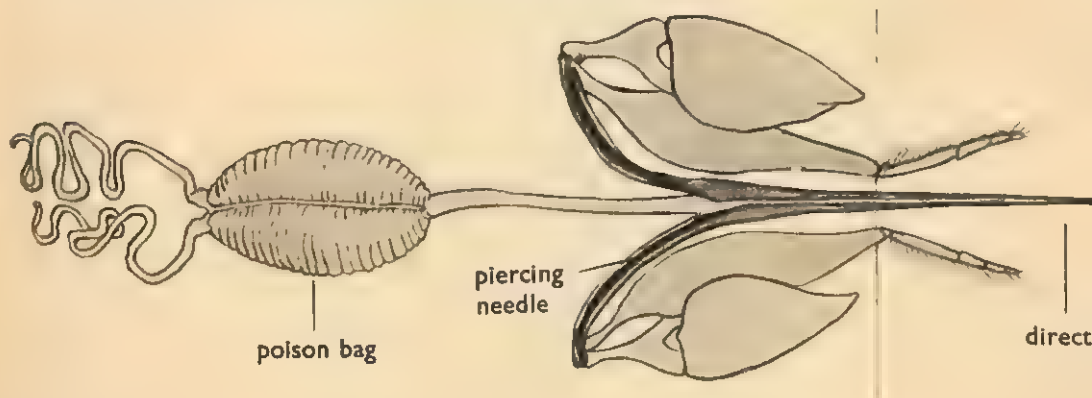


### *The Sting of a Wasp*

The queen and worker wasps each have a sting; the drones have none. The sting is hidden inside the body when not in use. It consists of three parts:

1. A poison bag which collects poison secreted by a poison gland.
2. Two piercing needles grooved on the inside; these lie close together when in use and form a tube through which the poison runs.
3. A director guides and protects the needles.

When a wasp stings you, the director guides the needles, which pierce your skin; muscles squeeze the poison bag so that poison runs down the tube and into your hand.



### *Can Wasps Smell?*

Experiments were done to try to answer this question. Two bundles were made to look exactly alike, but one bundle contained nothing but gauze, and the other contained gauze and some warm chicken bones. These bundles were placed at one side of the nest. The wasps on returning, even though loaded with food, could not resist the good smell and settled thickly on the bone bundle; the other they left untouched. Such experiments suggest that wasps have a good sense of smell.

### *Can Wasps see Colour?*

Some interesting experiments have been done to find an answer to this question. First a two-foot square of stiff red paper, with a circular hole  $4\frac{1}{2}$  inches in diameter, was placed over the entrance to the nest. This red paper caused great confusion among the home-comers, and it was a long time before one dared to enter. Then the others quickly followed. After about three hours they had become quite used to it and went in and out as usual.





After two days, the red paper was removed and a blue piece of similar size and shape was put in its place. Again there was great confusion, but after two hours they went in and out quite freely again. After another day had passed, the blue paper was removed, and the green grass caused suspicion.

If one of the coloured papers which had been over the hole of the nest for several days was then moved  $1\frac{1}{2}$  feet away, all the wasps watched tried to enter the nest through the paper. From these results, what answer would you give to the question, "Can wasps see colour?"

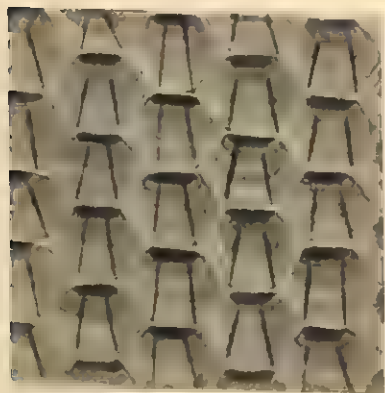
### *Different Kinds of Wasps*

In Great Britain there are many different kinds of wasps, but only seven of them live a community life. The one we have been talking about is called the COMMON WASP. Its nest, as you know, is usually built underground, but may sometimes be found in the hollow of a tree, or hanging from the roof of a shed. Another wasp which is often seen is called the GERMAN WASP; they always build underground. If you want to learn how to recognise these two, you will need a magnifying-glass to look at the colour markings on the head and thorax.

At one time it was thought that the common wasp always collected wood-pulp from old wooden palings and that the paper was grey in colour, while the German wasp used new wood and its paper was yellow. This is not really the case, and the nests of the two may be either grey or yellow.

HORNETS are other relatives of these wasps, and can easily be recognised by their large size and their brown and orange colour. Their nests contain only about two hundred workers and are usually built in the hollow of a tree. Sometimes there is no outer cover of paper to the nest and the cells of the sections are large, as

you would expect. The picture below shows a queen hornet and a piece of a section from her nest.



#### THINGS TO DO

1. Look for the position of wasps' nests during the summer. Watch workers and keep a diary of what you see them doing and any discoveries you make. Count the number of wasps leaving the nest every five minutes. How many is that in an hour?

2. In autumn, ask your teacher if she can get a nest for you to look at. If she is not able to, you may find one in your nearest museum.

3. Look for hibernating queens and try to discover some of the places in which queens sleep during the winter. Make a list of these places and the date you first saw the queen. Try to discover the date she wakes up in spring.

4. This book tells you about only three kinds of wasps. Read about other kinds for yourself.

5. Wasps are insects. The following are some of the common insects you may see: bees and ants, butterflies and moths, beetles, dragon-flies, caddis flies. You can read about them in some of the other books in this series.



## IDENTIFICATION OF BRITISH SOCIAL WASPS

It is often difficult to name wasps, for the colour markings vary very much in the workers and drones. The queens are the easiest to name.

There are several points to look for :

- (1) The shape of the black marks on the face.
- (2) The yellow stripes on the back of the thorax.
- (3) Do the compound eyes almost touch the jaws or is there a long space between?

The following notes, together with the coloured pictures of queens, will help in identification.

### A. Compound eyes almost touch the jaws.

- |  |  |
|--|--|
| (1) COMMON WASP ( <i>Vespula vulgaris</i> )  | } Queens, workers, and drones in the nest. |
| (2) GERMAN WASP ( <i>Vespula germanica</i> ) |  |
| (3) RED WASP ( <i>Vespula rufa</i> )         |  |

(4) AUSTRIAN WASP (*Vespula austriaca*). No workers known.

- (1) COMMON WASP. A black anchor shape on the face; two yellow stripes running from the neck to the base of the wings; the abdomen dull with no red marks. Usually underground builders. Very common.
- (2) GERMAN WASP. Three black spots on the face; two yellow triangles running from the neck to the base of the wings; the abdomen dull with no red marks. Usually underground builders. Very common.
- (3) RED WASP. Black anchor shape on the face; the abdomen rather shiny with a reddish band across the second segment, and reddish along the edge of black markings. Not often seen in houses.



- (4) AUSTRIAN WASP. The queen lays her eggs in the nest of the red wasp. No red colour on the abdomen. Legs with long hairs. Very rare in S.E. England.

B. *Compound eyes and jaws have a long space between them.*

- (1) TREE WASP (*Vespula sylvestris*)

- (2) NORWEGIAN WASP (*Vespula norvegica*)

- (1) TREE WASP. Single black spot on the face, and pale hairs; abdomen black and yellow with no red colour. Nests in hollow trees.

- (2) NORWEGIAN WASP. A central black stripe on the face; with black bristles. Abdomen with reddish colour at the edge of black marks. Usually builds nest in bushes. Rare in S.E. England.





*Vespa vulgaris* x2



*Vespa germanica* x2



*Vespa norvegica* x2



*Vespa sylvestris* x2



*Vespa austriaca* x2



*Vespa rufa* x2

Drawings made from material lent by the Natural History Museum, South Kensington.

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### OTHER BOOKS IN THIS SERIES

#### 1. AQUARIA

Gives instructions for the setting-up and maintenance of a fresh-water aquarium.

#### 2. POND DWELLERS

Gives information about animals and plants which are to be found in ponds.

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